REMARKS

Status of the Claims

Claims 1-13 and 16 are currently pending. Claims 14 and 15 have been canceled without prejudice or disclaimer of the subject matter claimed therein. Claims 8 and 10-13 are withdrawn from examination, as being directed to a separate invention. Claims 1-7, 9, and 16 are currently under examination.

Rejections under 35 U.S.C. § 103(a)

A. Claims 1-4, 6, 7, and 9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Magnuson *et al.* (Magnuson), Casterman I, or Casterman II in view of Owen *et al.* (Owen) Moloney *et al.* (Moloney), Herrera-Estrella, and Hilton.

Claim 1 as it stands is directed to a method of producing a functional heavy chain antibody or an active fragment thereof showing the antigen binding activity of the antibody in a plant. The method encompasses introducing into the plant a DNA sequence encoding the antibody and expressing the antibody, wherein the DNA sequence includes a sequence which expresses a peptide that targets the antibody or fragment thereof to the plastid of the plant. Thus, claim 1 and its dependent claims 2-7 and 9 encompass expressing a DNA sequence that includes a sequence encoding a peptide for targeting the antibody or fragment thereof to the plastid of the plant.

The Office Action acknowledges that Magnuson, Casterman I, Casterman II, and Owen do not teach a DNA molecule including a sequence encoding a peptide which targets the antibody or fragment thereof to the plastid of a plant (see page 5 of Office Action, dated November 14, 2006). Moreover, Magnuson, Casterman I, Casterman II, and Owen suggest that an ER targeting sequence is required for expression of functional antibodies in plants. Thus, these references teach away from the present invention of targeting a functional heavy chain antibody or a fragment thereof to the plastid of a plant.

Moloney does not teach production of antibodies in plants or targeting of antibodies to the plastids of plants. The reference of Moloney is a review article discussing subcellular targeting and purification of recombinant proteins in plants. The reference does not disclose the production of functional heavy chain antibodies or fragments thereof in plants or the targeting of

heavy chain antibodies or fragments thereof to the plastids of plants.

Likewise, Herrera-Estrella does not teach production of functional heavy chain antibodies or fragments thereof in plants or the targeting of these antibodies to the plastids of plants. Herrera-Estrella discloses chimeric DNA sequences encoding a transit peptide and a polypeptide heterologous to the transit peptide for transport of the polypeptide into the chloroplast of a plant cell. However, Herrera-Estrella does not teach or suggest expression of functional heavy chain antibodies or fragments thereof in plants.

Neither Moloney nor Herrera-Estrella teaches or suggests that functional heavy chain antibodies or fragments thereof can be produced in plants and/or targeted to the plastids of plants. Since Magnuson, Casterman I, Casterman II, and Owen require an ER targeting sequence for the production of functional heavy chain antibodies, there is no motivation to combine the teachings of the cited references, and there is no reasonable expectation of success in making the necessary modifications to the teachings of the cited references for obtaining the claimed invention.

Moreover, Hilton does not teach production or subcellular targeting of proteins in plants. Hilton only discloses that phytochromes are associated with the chloroplast envelope membranes. Hilton does not disclose production of antibodies in plants or targeting of antibodies to the plastids of plants. Further, phytochromes and heavy chain antibodies are structurally and functionally distinct molecules. Thus, there is no motivation to combine the teachings of Hilton, the cited references which teach expression of heavy chain antibodies in plants, and the cited references that teach production of proteins in plants.

Thus, the cited references do not render the claimed invention obvious.

B. Claims 1-5, 7, 9, and 16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Magnuson *et al.* (Magnuson), Casterman I, or Casterman II in view of Le Gall *et al.* (Le Gall), Moloney *et al.* (Moloney), Herrera-Estrella, and Rohozinski *et al.* (Rohozinski *et al.*).

As discussed above, claim 1 and its dependent claims are directed to a method of producing functional heavy chain antibodies and fragments thereof and targeting the antibodies to the plastid of plants.

The deficiencies of Magnuson, Casterman I, Casterman II, Moloney, and Herrera-Estrella

are discussed above. Le Gall and Rohozinski do not cure the deficiencies of Magnuson, Casterman I, Casterman II, Moloney, and Herrera-Estrella.

Like the cited primary references, Le Gall does not teach production of functional heavy chain antibodies or fragments thereof in plants and targeting the antibodies to the plastids of the plants. Also, Le Gall does not teach a DNA molecule that includes a sequence encoding a peptide for targeting the heavy chain antibodies or fragments thereof to the plastids of a plant. Moreover, Le Gall specifically indicates that the vector for expressing scFv contains the leader sequence pelB which would express the scFv through the secretory (ER) pathway. Importantly, Le Gall neither teaches nor suggests expressing antibodies in the plastids of a plant. Rather, Le Gall teaches away from the instant invention as it suggests that an endoplasmic reticulum targeting sequence is necessary to produce functional antibodies in plants.

Also, Rohozinski does not teach production of functional heavy chain antibodies or fragments thereof in plants and targeting the antibodies to the plastids of the plants. Rohozinski teaches that the assembly of TYMV occurs within the intermembrane space of chloroplasts. Rohozinski neither teaches nor suggests the production of functional heavy chain antibodies or fragments thereof in plants. Further, Rohozinski does not teach or suggest subcellular targeting of heavy chain antibodies to the plastids of the plants.

Accordingly, Applicants respectfully submit that there is no motivation to combine the teachings of the cited references, and that there is no reasonable expectation of success in making the necessary modifications to the teachings of the cited references for obtaining the claimed invention. Thus, the cited references do not render the claimed invention obvious.

Non-Statutory Obviousness-Type Double Patenting Rejections

A. Claims 1-7, 9 and 16 are provisionally rejected on the ground of non-statutory obviousness type double patenting as being unpatentable over claims 1-9 and 11-12 of copending U.S. Patent Application No. 11/267,191.

Without acquiescing to the propriety of this rejection, Applicants respectfully point out that this is a provisional obviousness-type double patenting rejection between two applications. MPEP 804 (I)(B) (page 800-19) states,

> If the "provisional" double patenting rejection in one application is the only rejection remaining in that application, the examiner should then withdraw that

rejection and permit the application to issue as a patent, thereby converting the "provisional" double patenting rejection in the other application(s) into a double patenting rejection at the time the one application issues as a patent.

Accordingly, Applicants respectfully request withdrawal of this double patenting rejection.

B. Claims 1-7, 9 and 16 are provisionally rejected on the ground of non-statutory obviousness type double patenting as being unpatentable over claims 1-9 and 11-12 of copending U.S. Patent Application No. 11/267,310.

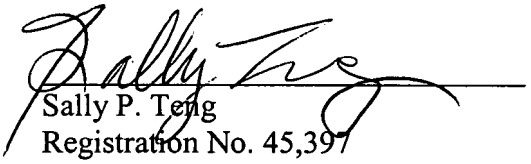
Without acquiescing to the propriety of this rejection, Applicants respectfully point out that this is a provisional obviousness-type double patenting rejection between two applications and that MPEP 804 (I)(B) (page 800-19) also applies in this instance. Accordingly, Applicants respectfully request withdrawal of this double patenting rejection.

Conclusion

The foregoing amendments and remarks are being made to place the application in condition for allowance. Applicants respectfully request entry of the amendments, reconsideration and the timely allowance of the pending claims. A favorable action is awaited. Should the Examiner find that an interview would be helpful to further prosecution of this application, she is invited to telephone the undersigned at their convenience.

If there are any additional fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-0310. If a fee is required for an extension of time under 37 C.F.R. §1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully submitted,
Morgan, Lewis & Bockius LLP



Sally P. Teng
Registration No. 45,397

Date: May 14, 2007
Morgan, Lewis & Bockius LLP
Customer No. **09629**
1111 Pennsylvania Avenue, N.W.

Washington, D.C. 20004
Tel: 202-739-3000
Fax: 202-739-3001